

# HISTORY OF MARINE SCIENCES (EXCEPT ICHTHYOLOGY) IN INDIA

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The history of marine science is, in fact the history and achievements of several institutions and organisations, mainly governmental but also a few learned societies and many individual scientists' contributions. As Calcutta was the earlier capital of British India, pioneering studies naturally started there and flourished. Parallel to the natural history studies and animal and plant collections of the Bombay Natural History Society, leading to the establishment of the Prince of Wales Museum in Bombay, the Indian Museum — itself the offspring of the Royal Asiatic Society of Bengal — was the progenitor of the Zoological Society of India. Its sister institution, near Calcutta, is the Botanical Survey of India. The Marine Survey of India, most well known for the deep-sea investigations by *R.I.M.S.S. Investigator*, was one of the first to pursue marine sciences, and can be considered the "Father" of the National Institute of Oceanography and the Department of Ocean Development which had its own ship *O.R.V. Sagar Kanya* and had annual forays to Antarctica.

Other British Indian territories in peninsular India were the Madras Presidency which extended to Malabar and South Kanara on the west coast of India and Bombay Presidency which even included Sind (now in Pakistan). Pioneering marine biological studies were carried out here. Bombay has the popular Taraporevala Aquarium with its connected Taraporevala Marine Biological Station. It is also the Headquarters of the Fishery Survey of India and the Central Institute of Fisheries Education, a Deemed University. The erstwhile Madras Presidency was fortunate in having some of the richest coral reefs in the Gulf of Mannar, and the Bulletins of the Madras Government Museum, especially the series covering Krusadai Island, are the predecessors of the present day *Bulletins of the Marine Biological Association of India*.

Among the princely states, Travancore, Cochin and Baroda had enlightened maharajas who sponsored and encouraged prime studies in marine biology. The former two, now part of Kerala, house the head offices of the Central Marine Fisheries Institute and the Central Institute of Fisheries Technology at Ernakulam, and their universities have been consistently doing yeoman research in marine biology and oceanography. Although Baroda State was landlocked, its territories included Okha and Kodinar. The farsighted Gaekwads (rulers) of Baroda State utilised the services of English marine biologists to carry out extensive surveys of Okhamandal, as it was then known, the richest coral reef area on the mainland's west coast.

## INTRODUCTION

India has stood out for nearly two thousand years as a maritime subcontinent, with sea trade connections from Africa, Madagascar and Arabia in the west to Indonesia, Cambodia and China in the east. This necessitates a grasp of navigation, monsoon winds, currents and tides. From this, one would believe that our coastal people would also have acquired knowledge of

the organisms dwelling in the sea, but such knowledge was confined to large ones like whales and sharks, from their carcasses sometimes washed ashore. There are ample references to animals in Indian mythology, legends and folklore, but, with a few exceptions, these pertain to mammals, birds and reptiles. Vedic texts mention only a few marine animals such as the chank (*sankha*) and pearl-shells; one can only conclude that Vedic civilisation came into very little contact with maritime states and civilisations (Rao 1957). It was left to European naturalists who ventured to our country, for trade and subsequent colonisation, to lay the foundations for marine biology.

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One of the earliest descriptions of an Indian marine animal dates back to 'Observations made on a tour made from Bengal to Persia in the years 1786-87' [p. 236 in PINKERTON'S VOYAGES AND TRAVELS (1811)], wherein Ensign W. Francklin states that "the most remarkable animal curiosity the island" — he refers to Bombay (=Mumbai) — "produces is a small fish... about four inches long, (having) upon the top of its back and near the head, a small valve on the opening of which you discover a liquor of a strong purple colour which when dipped on a cloth, retains the hue. It is found chiefly in the months of September and October. (This obviously refers to the sea-hare *Aplysia*.)

The first record of seaweeds is based on Wallich's marine algae preserved on herbarium sheets in 1822. This predates Wight's collection in 1826 from the coast of 'Hindustan' and Madras (published in PRODROMUS FLORAE PENINSULAE INDIAE ORIENTALIS) in 1834.

Among the several scientific organisations in India, only a few deal exclusively with marine sciences. Thus, many universities and even some governmental institutions, which have various pure and applied sciences as their main objectives, also include marine biology. Over the years, the impact of physics, chemistry, geology and meteorology have merged to make marine sciences a multi-disciplinary subject. For the sake of convenience, the marine sciences are dealt with state-wise.

#### WEST BENGAL

Any reference to the history of marine science would be incomplete without the inclusion of five organisations, none of which deals exclusively with marine sciences, but all five of which are interlinked. These are: the Asiatic Society of Bengal, the Marine Survey of India, the Indian Museum, the Zoological Survey of India, and the Botanical Survey of India.

#### The Asiatic Society of Bengal

The Asiatic Society of Bengal was founded in 1784 by Sir William Jones to "elucidate the peculiarities of Art and Nature in the East"; at that time it was known simply as the Asiatic Society. The Society's Journals and Proceedings were popular receptacles for erudite scientific papers, and naturalists sent zoological specimens to the Society for examination and retention. Sir William Jones was opposed to the idea of collecting zoological objects, as he felt that this entailed the destruction of wildlife. Nevertheless, the number of specimens built up to such an extent that in 1796, it was thought fit to have a suitable building to house the Society. In 1808, the Society finally came to have its own building, and its museum, popularly known as *Jadu Ghar* (house of mysteries) was established in 1814.

Dr. Nathaniel Wallich combined his duties as Superintendent of the East India Company's Botanic Garden with the superintendentship of the Asiatic Society's museum. In 1836, there was a scam in the Society's bankers, Palmer & Co., and appeals to the government for financial support were finally heeded in 1839. On Wallich's retirement, the new Curator was John McClelland, a distinguished naturalist, followed in 1841 by Edward Blythe.

In 1936, the King of England was pleased to permit the Society to use the prefix "Royal"; thus it became the Royal Asiatic Society of Bengal.

#### The Marine Survey of India

This was established in 1874 by the Government of India, at the request, in 1871, of the Council of the Asiatic Society of Bengal, which recommended the undertaking of deep-sea dredging in Indian waters.

The primary aim of marine survey is the safeguarding of navigation along the local lines of commerce by making charts and sailing directions for mariners, local peculiarities of currents and tides so as to make a safe approach to land, and conditions of ports and harbours for



shelter and supplies. Added to this was a secondary purpose — that of obtaining knowledge of the hydrography of local sea-basins, their depth and temperature, deposits forming in their abysses and the life that inhabits them. For the latter purpose, officers called Surgeon-Naturalist formed a complement of the ship; they were medical personnel looking after the health of the crew, but were also interested in biology and involved themselves in scientific studies.

The surveying of Indian waters is an old undertaking. Prior to the Marine Survey of India, marine surveys were conducted by the Indian Navy from 1832, to 1862 when this service was abolished. These operations covered an extensive area from Iraq to Seychelles, and involved the upper reaches of the Rivers Euphrates and Tigris, the ruins of Nineveh and Babylon, and the discovery of the source of the River Oxus. Dr. H.J. Carter, F.R.S., a medical officer in the Indian Navy, became a leading authority on the lower invertebrates, especially sponges, while Dr. Theodore Cantor specialised in the fishes of Malaysia.

Even before the advent of the Indian Navy, marine surveys were carried out, from the Red Sea to China, by the Bombay Marine.

From 1874 to 1881, the Marine Survey had no ship capable of deep-sea research, so that the first Surgeon-Naturalist, J. Armstrong of the Indian Medical Service, had to confine himself to the zoology of the shallow-water and littoral region, though he did occasionally manage to dredge down to 150 m.

In 1876, it was decided to construct a ship suitable for deep-sea dredging. This was built at Bombay, which was then renowned for the quality of its boats and carpentry skills of the Parsee master-craftsmen. While English ships made of oak wood hardly lasted twenty years, those made of teak by Bombay's Parsee boat builders, brought from Surat by the English, have survived for seventy, eighty and even a hundred years. The

ship, named the *R.I.M.S.S. (Royal Indian Marine Survey Ship) Investigator*, was a paddle-steamer of 580 tons displacement with two funnels, and was launched in 1881. (An account of its history and equipment may be seen in the *Scientific Memoirs of the Medical Officers of the Army of India* for 1898.)

The *R.I.M.S.S. Investigator* was not the first ship of its name; it had illustrious predecessors. In 1850, a ship of this name set out to discover the fate of Sir John Franklin and his ship, which had left England in 1846 in search of a northwest passage from the Atlantic to the Pacific Ocean. Some channels in the Mergui Archipelago have been named after another ship, *Investigator*, of the Bombay Marine.

While the *R.I.M.S.S. Investigator* was being built, the mother of all oceanographic expeditions — *H.M.S. Challenger* — was just over. The excitement caused by the sensational discoveries of deep-sea life led the Asiatic Society of Bengal to ask the government to equip the new vessel for deep-sea dredging. The outcome was that a substantial portion of the oceanographic equipment used on *H.M.S. Challenger* was transferred to *R.I.M.S.S. Investigator*.

After Armstrong relinquished his post in 1879, the post of Surgeon-Naturalist remained vacant until 1894, when Surgeon G.M.J. Giles took over. In the meantime, the Trustees of the Indian Museum sent Dr. J. Wood-Mason to the Andaman Islands to investigate the fauna, and he managed to carry out trawling at depths of 180 to 540 m on board the Guard-ship, *S.S. Undaunted*. From then on till 1904, was the heyday of deep-sea dredging and trawling by *Investigator* in depths as great as 3,650 m. More than 70% of the species of deep-sea animals brought up by the *Investigator* turned out to be new to science.

Lt. Col. A.W. Alcock, who joined as Surgeon-Naturalist in 1888, until 1892, was one of the most notable scientists connected with the *Investigator*. With a chequered career varying from a teacher of Classics in Darjeeling and an



assistant on one of the plantations in Bihar, to Medical Officer with the Punjab Frontier Force and Deputy Sanitary Commissioner, Bengal, he was to carcinology what Sir Francis Day was to ichthyology in India, his *magnum opus* being the series of papers from 1895 to 1900 titled "Materials for a Carcinological Fauna of India."

By the beginning of the 20th century, the work of the Marine Survey of India had attracted so much attention that, when H.R.H. Prince Albert I of Monaco erected the now world-renowned Institute of Oceanography, the name of *Investigator* was carved on its facade, along with other equally famous oceanographic ships such as *Challenger*, *Travailleur*, *Talisman*, *Gazelle*, *Novara* and others.

In 1908, *R.I.M.S.S. Investigator* was scrapped and was replaced by *Investigator II*; this was a steel ship of 1,018 gross tons built by Vickers Maxim & Co. in the U.K. Lt. Col. R.B. Seymour Sewell joined as Surgeon-Naturalist in 1910. By then more emphasis was placed on investigations of the seas.

With the outbreak of the First World War in 1914, survey was suspended, and resumed only in 1921. Thereafter, survey of the Maldivian Archipelago and Nicobar Islands was begun, so Sewell studied the corals in the region. In 1925, Sewell left the Marine Survey to take up the post of Director, Zoological Survey of India, and Major R.W.G. Hingston replaced him as Surgeon-Naturalist, but only for a year. The post of Surgeon-Naturalist was converted to Naturalist to the Marine Survey, attached to the Zoological Survey of India. However, the post was not filled up, so the work of Surgeon-Naturalist came to an end in 1926. After that, no Marine Survey organisation existed, so that work on marine fauna was restricted to shore collections. Then in 1959, the Zoological Survey of India started a small Marine Survey Unit (subsequently enlarged to a Marine Survey Division in 1964) based at Calcutta (=Kolkata). It acquired a research boat, named *Chhota Investigator* in 1975, fitted with

hydrographical and survey equipment.

Consequent to the vast oceanographic and faunal studies carried out by the *Investigator*, numerous invaluable scientific papers have been published.

The Memoirs drawn up by the Council of the Asiatic Society of Bengal for proposals to the Government of India to undertake deep-sea dredging, and the letter forwarding the same, have been published in the *Proceedings of the Asiatic Society of Bengal*, 1871. Details of *R.I.M.S.S. Investigator*, its history and the equipment thereon are given in a paper titled "A summary of the deep-sea work of the Royal Indian Marine Survey Ship 'Investigator' from 1884 to 1897," published in the *Scientific Memoirs of the Medical Officers of the Army of India*, 1898.

The work done on the ship was published in several parts as "Natural history noted from Royal Indian Marine Survey Ship 'Investigator'" from 1885 in the *Journal of the Asiatic Society of Bengal*.

### Zoological Survey of India

This organisation is covered in a separate chapter in this Centenary Volume. However, the author, Dr. J.R.B. Alfred's coverage of the pre-1947 history of the organisation is limited to field studies. Hence, it would not be amiss to include other historical background of the organisation's beginnings here.

The Zoological Survey of India (ZSI) owes its birth to a proposal presented to the Government of India by the Trustees of the Indian Museum which reads as follows: "If zoology is to play the role the age calls for, it must be freed from the constricting tradition of classification, literature and the arts." The Government of India agreed with the Trustees' views, with the result that the Zoological and Anthropological Sections of the Indian Museum were detached therefrom, and formed the Zoological Survey of India. (The Anthropological Section formed part of the ZSI until November 31, 1945.)



The ZSI's first Director was Dr. Thomas Nelson Annandale. With his appointment, taxonomic work was initiated on Decapod Crustacea, sponges and fishes. However, his major contribution has been the starting of the *Records of the Indian Museum* and the *Memoirs of the Indian Museum* in 1907.

When Dr. Annandale died in 1924, Dr. Stanley Wellis Kemp officiated as Director of ZSI. Earlier, in 1920-21, when Dr. Annandale had gone on leave to England, Kemp had acted as Director, and he proposed the establishment of a Marine Biological Station at Port Blair in the Andaman Islands, but nothing came out of the proposal. He had hardly been Director at ZSI for six weeks, when he left to become the first Director of Research of the *Discovery* Investigations. On Dr. Kemp's leaving ZSI, Dr. Bains Prashad officiated as Director until 1925, when Major Sewell took over again as Director, and remained so till his retirement in April 1933. The original post of Director was then abolished and instead, the designation of the Superintendent was changed to Director (but on the Superintendent's pay).

During the Second World War, enemy troops had advanced to Burma and Kohima in Nagaland, and there was fear about the safety of the collections of ZSI, which were housed in the Indian Museum, Calcutta. All type-specimens and Class I exhibits were therefore shifted to the Forest Research Institute, Dehra Dun, while the library, other collections and the staff were sent to Benares at Kaiser Castle, a number of semi-detached buildings on the River Varuna.

In September 1943, this river was in spate due to floods and its waters entered the underground cellars, remaining at ceiling height for two days and ruining the collections, library books and accession registers. In the resulting confusion, publication of the *Records* and *Memoirs of the Indian Museum* were suspended.

The ZSI was shifted back to Calcutta in 1948-49, to be housed at Jabakusum House on Chittaranjan Avenue. The library and Taxidermy

Section went back to the Indian Museum premises. The Director's post was vacant from October 1973 to May 1977.

The *Records of the Indian Museum* and *Memoirs of the Indian Museum*, which had been suspended, recommenced in 1962, under the new names — *Records of the Zoological Survey of India* and *Memoirs of the Zoological Survey of India*. In 1976-77, a new series, *Occasional Papers of the Zoological Survey of India* was started, to be followed soon after by three new journals, namely, *Technical Monographs*, *Bulletins of the Zoological Survey of India* and *Handbooks of the Zoological Survey of India*. The monumental series *Fauna of British India*, started by the British in 1888, was renovated in 1975 under a new name — *Fauna of India*.

The foundation stone of the new Headquarters building was laid on November 18, 1976 at New Alipore, and ZSI finally shifted to this ten storey building, named Prani Vigyan Bhavan in 1987. With the establishment of the Department of Environment by the Government of India in November 1980, the ZSI came under its administrative jurisdiction. Eight acres of land were set aside at Digha (on the West Bengal coast) for setting up an aquarium-cum-research centre.

### Botanical Survey of India

Towards the middle of the 19th century, the excellent work done at the Royal Botanic Gardens at Kew (in U.K., the Mecca of all botanists) began to guide the direction of botany in India. Advances in botanical studies, particularly plant collecting, in the 1830s and '40s led to the undertaking of two great enterprises, namely, the Flora of the higher plants, and the Indian Forest Service, resulting, ultimately, in Hooker's *FLORA OF BRITISH INDIA*.

The Botanical Survey of India was established much earlier than its sister organisation, the Zoological Survey of India, i.e. in 1890, with Sir George King as its first Director. However, it had a chequered history; after



functioning actively for about a decade, it worked fitfully for three decades and lapsed into dormancy after the retirement of its last British Director, Dr. C.C. Calder in 1939.

It was long after India's independence from colonial rule, in 1955, that the Botanical Survey of India was revived, with the appointment of Fr. H. Santapau, S.J. as ad-hoc Director. He was followed by Dr. J.C. Sen Gupta as Chief Botanist.

The *Bulletin of the Botanical Survey of India* started in 1959, and a new Flora of India series was started, with its Fascicle coming out in 1978.

Coming back to the work done in West Bengal, mention must be made of the shallow water fauna trawled by the Bengal Fisheries Steamer *Golden Crown* in 1908-11, and those collected at the mouth of River Hooghly by the Bengal Pilot Service in the 1930s.

#### ORISSA

The most prominent faunistic work done in this State was on Chilka Lake; publications on these studies commenced in 1916, in the form of a Memoir (Vol. 5, Nos. 1-13) of the Indian Museum.

#### ANDHRA PRADESH

Probably all the marine biological work done in this State owes its excellence to the studies undertaken at the Department of Marine Sciences of the Andhra University at Waltair (Visakhapatnam). Established in 1926, the Department's studies veered towards oceanography in 1952 under the able guidance of Professors E.C. LaFond and P.N. Ganapati. Now there is also a Centre of Assistance in Marine Geology, Zoology, Geophysics, Meteorology and Oceanography.

#### TAMIL NADU

The erstwhile Madras Presidency was the earliest and foremost organisation to produce

quality work in marine biology. This is borne out by the series of excellent Catalogues and Bulletins brought out by the Madras Government Museum, which are a tribute to the marine biologists of those days. The first *Catalogue of the Madras Government Museum* appeared in 1874, but dealt with ancient coins. The first Catalogue dealing with marine life appeared in 1887, and was written by E. Thurston under the title "Preliminary Report on the Marine Fauna of Rameswaram, and the neighbouring Islands." In 1890, the same author brought out a Catalogue titled, "Pearl and chank fisheries and marine fauna of the Gulf of Manaar."

The *Bulletin of the Madras Government Museum* started in 1894. The four parts of Vol. I are all written by E. Thurston and are titled: No. 1 - Pearl and chank fisheries of the Gulf of Manaar; No. 2 - Notes on Tours along the Malabar coast; and No. 3 - Rameswaram Island and fauna of the Gulf of Manaar (1895). (No. 4 is on anthropology.) It may be noted that the Madras Presidency then extended even to the Malabar (now in Kerala) and South Kanara (now in Karnataka) coasts of western India.

These Bulletins continued until 1907, but, except for Vol. III, No. 2, titled "Sea fisheries of Malabar and South Kanara" by Thurston, all the others deal with anthropology. After a lapse of several years, the Bulletins recommenced as a new series from 1927. Vol. I, No. 1 of the Natural History Section covered "The littoral fauna of Krusadai Island in the Gulf of Mannar, with appendices on the vertebrates and plants." This has been followed by consistently good Bulletins, dealing mostly with animal groups on Krusadai Island, not covered in the first volume.

Realising the rich potential for study offered by the coral reefs and associated flora and fauna, a Marine Biological Station was started at Krusadai Island in 1922. However, the pride of the State was the Madras Aquarium, which opened even earlier, on October 21, 1909. Situated at a strategic location on the Triplicane (Marina) Beach opposite Presidency College,



it was constructed at the then princely amount of Rs. 17,604. It had been the brainchild of Mr. E. Thurston, Superintendent of the Madras Museum, but he retired before its completion. For ten years it remained in the charge of the Superintendent of the Museum, but in 1919 it was transferred to the Department of Fisheries.

The vicissitudes of the Second World War forced the Madras Aquarium to close down in 1942; it reopened after well over a decade in an attenuated form, exhibiting, mainly, a few small species of freshwater fishes.

Of an equally high quality as the Bulletins of the Madras Government Museum were those brought out by the Madras Department of Fisheries. The first *Madras Fisheries Bulletin* came out in 1905, and by 1923 there were 17 of them, covering topics ranging from oyster culture to *bêche-de-mer*.

Apart from government institutions, valuable research is also undertaken by universities. The oldest, the University of Madras established in 1857, has both Botany and Zoology Departments. The former changed its name in 1964 to become the Centre of Advanced Study in Botany. The School of Biological Sciences, of the Madurai Kamaraj University, has a Marine Science Station at Tiruchendur, near Tuticorin. The Marine Biological Station of Annamalai University, which was established at Parangipettai (Porto Novo) in 1952, became a separate department of the University in 1955 and was, in 1963, recognised as the Centre of Advanced Study in Marine Biology.

#### ANDAMAN AND NICOBAR ISLANDS

Marine biological studies started quite early in "the Bay Islands." It was back in 1871, that the Trustees of the Indian Museum sent Dr. J. Wood-Mason to the Andaman Islands to investigate the fauna. However, though the *R.I.M.S.S. Investigator* had many stations in the Andaman Sea, it was almost a century later, during the 3rd

Five-year Plan (1961-62 to 1965-66) that a joint field expedition visited the Great Nicobar Island.

The establishment of the Andaman and Nicobar Regional Circle at Port Blair by the Botanical Survey of India in 1972, followed five years later by that of the Regional Station by the Zoological Survey of India, gave a much needed fillip to marine biological work, and its tempo picked up after this.

Many ships have carried out oceanographic work in the Indian Ocean: examples are *Challenger* (1874-75), *Gazelle* (1874-75), *Elizabeth* (1877), *Penguin* (1891), *Waterwitch* (1895), *Stork* (1897), *Valdivia* (1898-99), *Gauss* (1901-03), *Sealark* (1906), *Planet* (1906), *Howe* (1913), *Merlin* (1920), *Amiraglio Magmachi* (1924), *Ormonde* (1927), *Snellius* (1929), *Dana* (1929-30), *Discovery II* (1930-51), *Albatross* (1948), *Charcot* (1949-50), *William Scoresby* (1950), *Galathea* (1950-52), *Ob* (1955-57), *Laperouse* (1956), *Norse I* (1955-57), *Owen* (1957-58), *Atlantis* (1959) and *Vityaz* (1960).

*Investigator* obtained data both in the Bay of Bengal and the Arabian Sea, but the only ship which exclusively studied the Arabian Sea was *H.E.M.S. Mabahiss*, of the John Murray Expedition (1933-34), led by Lt. Col. R.B.S. Sewell. The purpose of the expedition was to study the areas west of the Laccadive and Maldivic Archipelagoes, which had not been covered by *Investigator*: the ship was based at Alexandria in Egypt.

#### LAKSHADWEEP ISLANDS

Like the Bay Islands, a fair share of the work done by *R.I.M.S.S. Investigator* was also devoted to the Lakshadweep. Before independence, Laccadive Islands as they were then called together with Maldivic Islands, were part of the British Indian Empire. After independence, while Maldivic Islands became a separate new nation, the Lakshadweep-Minicoy group remained as a part of India. They then formed part of the erstwhile Madras State, but, in



November 1956, they became a Union Territory being administered from Calicut. From March 1964 the administrative capital is Kavaratti, one of the islands. Unlike the coral reefs of the Andaman Islands, which are of the fringing type, Lakshadweep and Maldivian Islands are coral atolls: the islands were made by the coral animals and slowly rose above sea level.

Studies prior to independence included both the Maldives and Laccadives. The most notable piece of work on the group is the collection of papers, edited by J. Stanley Gardiner and titled "The Fauna and geography of the Maldivian and Laccadive Archipelagoes." The first volume, of 471 pages was published in 1903, while Volume II, of 1,079 pages, came out in 1906.

#### KERALA

The present Kerala State is comprised of the erstwhile States of Travancore and Cochin and the Malabar District of the former Madras Presidency. The erstwhile University of Travancore (now Kerala University) had its own Department of Aquatic Biology and Fisheries, established in 1938 and shifted to the Aquarium in 1940. The Aquarium at Trivandrum was the second oldest in India and was the only one to be run by a university. The University's Bulletins of the Central Research Institute maintained a high standard, and are now published as Bulletins of the Department of Marine Biology and Oceanography. The University has its own research boat, *R. V. Conch*, and the Indian Ocean Biological Centre, established by UNESCO in 1963, occupies a wing of the building housing its oceanographic laboratory.

As early as the beginning of the 20th century, the Fisheries Department of the then Madras Presidency opened a marine laboratory at West Hill, Calicut on the west coast of the Presidency (now in Kerala).

The Cochin University of Science and Technology, established in 1971, had its own

School of Marine Sciences. The Naval Headquarters started a Naval Physical and Oceanographical Laboratory in Cochin in 1952; in 1958, it was brought under the Defence Research and Development Organisation, and is now under the Research and Development Headquarters, Ministry of Defence. Its present activities include oceanography, acoustics, and development of electronic instrumentation. The Centre for Earth Science Studies, established by the State Government in 1978, also has bearing on subjects such as geophysics, seismology, etc.

Kerala is, at present, the headquarters of the Central Marine Fisheries Research Institute (CMFRI), which was established just before India's independence, in February 1947 at Mandapam camp in Tamil Nadu, and was later shifted to its present site. This Institute does not fall within the purview of this article and I am just mentioning it as it has been the training ground of scientists who later shifted to greener pastures. Thus, Dr. N.K. Panikkar, its second Director, was instrumental in founding the National Institute of Oceanography, while Dr. T. Jones, who succeeded him, started the Marine Biological Association of India in 1958. This Association has been doing yeoman service to the cause of marine biology, bringing out its own journal and organising symposia. The subjects of these symposia have been Scombroid fishes, Crustacea, Mollusca, Corals and coral reefs, Coastal Aquaculture, and Endangered Marine Animals and Marine Parks.

#### KARNATAKA

The Department of Post-graduate Studies and Research in Marine Biology, of the Karnataka University, has a marine laboratory at Kodibag, Karwar dating back to 1975, while the staff and students of the College of Fisheries at Mangalore, apart from research in marine fisheries, have also studied other marine animals.



## GOA

Having been a Portuguese colony till 1962, the foremost name of a marine science organisation that is associated with Goa is the National Institute of Oceanography. The genesis of NIO is a long and interesting tale.

**National Institute of Oceanography**

In the 1950s, it was felt that, while the Atlantic and Pacific Oceans had been studied (from an oceanographic viewpoint), the Indian Ocean had been neglected. As this Ocean was bordered by poor, developing nations, it was beyond the financial capacity of a single country to study it. At a meeting of the SCOR (Scientific Committee on Oceanic Research) at Woods Hole, USA, in 1957, it was decided to launch an International Expedition to the Indian Ocean. This was endorsed by UNESCO.

On the Indian side, Government set up the Indian National Committee on Oceanic Research (INCOR) in 1960, under the chairmanship of Dr. D.N. Wadia, F.R.S., a leading geologist, to plan and coordinate India's programme in the International Indian Ocean Expedition (IIOE). To implement this programme, the Council of Scientific and Industrial Research (CSIR) set up the Directorate of Indian Ocean Expedition in 1962, with Dr. N.K. Panikkar as its Director. One year later, an Indian Ocean Biological Centre (IOBC) was established in Cochin to study the zooplankton collected during the IIOE.

As India did not have an oceanographic ship at that time, (*Investigator II* had stopped work in 1938), a minesweeper of the Indian Navy, *I.N.S. Kistna* was fitted for oceanographic work. Some 54 ships, belonging to 13 nations, took part in the IIOE from 1960 to 1965.

India's involvement in IIOE resulted in experienced scientific personnel trained for oceanographic work. The Government, therefore, decided to make use of the potential by establishing, in 1966, a national laboratory under

CSIR, to be called the National Institute of Oceanography (NIO). It began in 1969 with its headquarters in a rented building on Miramar beach at Panjim, Goa. Its own complex came up later at Dona Paula.

After Dr. Panikkar's retirement in 1973, Dr. S.Z. Qasim, yet another former Director of CMFRI, took over as Director. Around this time, the Naval Hydrographic Office was carrying out oceanographic cruises on *I.N.S. Darshak*. In 1976, NIO got its own research vessel, *R.V. Gaveshani*. This was a 68 m, 1,900 ton hopper barge converted for oceanographic work by Garden Reach Shipbuilders at Calcutta, and capable of accommodating 19 scientists and 45 officers and crew. It was decommissioned in 1989, but was recommissioned in 1991.

The 1980s saw a spurt in oceanographic activities, the most important being the annual visits to Antarctica on chartered ships by personnel from Defence research and various civilian research institutions. NIO got another, this time highly sophisticated, oceanographic ship, *O.R.V. Sagar Kanya*, in 1983. This is a 100 m, 4,209 gross ton ship with accommodation for 32 scientists and 50 officers and crew. [Other ships connected with oceanographic work are the Oil & Natural Gas Commission's seismic vessel *Anveshak* (acquired in 1973), the Geological Survey of India's *Samudra Manthan* (1983) and a fisheries research vessel *Sagar Sampada* (1985).]

Marine sciences received a fillip in 1981 with the setting up of the Department of Ocean Development (DOD). DOD owns *O.R.V. Sagar Kanya* and has entrusted NIO to organise its scientific programmes. The result is that NIO, which started with about 50 scientists and supporting staff in 1966, now has over 630 personnel, with regional stations at Cochin, Mumbai and Waltair.

## MAHARASHTRA

As with the erstwhile Madras Presidency, which had done yeoman marine studies as far



back as the 19th century, the former Bombay Presidency (now split up since 1960 into Gujarat and Maharashtra) carried out excellent work on India's western coast. To understand the reason for this, one must have an idea of the natural advantages offered by this region. Why is it that marine activities have played such an important role in developing its capital, Mumbai — once a group of seven islands inhabited by fishermen and toddy-tappers? One of the main reasons for its maritime prosperity has been the superb quality of its boats and the skills of its boatbuilders. When the East India Company acquired Bombay (now Mumbai) as part of the dowry brought by the Portuguese princess Catherine of Braganza by her marriage to King Charles II, the English soon noticed that, while their men-of-war, built of sturdy oak, hardly lasted twenty years, local boats made of teak stood the ravages of time and woodborers for seventy, eighty and even a hundred years. They invited the skilled Parsee boatbuilders of Surat to come over to Bombay and settle there. (The Parsees are a minuscule community of Zoroastrians which fled from Iran over 1,360 years ago to avoid persecution when the Muslims conquered Persia). *H.M.S. Trincomalee* (now called *Foudroyant*), built by Maneckji Lavji Wadia, a Parsee master shipbuilder, using teak from the Dangs forest of Gujarat, is the oldest ship in the world still afloat and in active service. Lord Nelson (of the naval Battle of Trafalgar fame) visited Bombay in 1775, and his brother, serving in the Indian Navy, was murdered in Bombay; his mortal remains lie in the cemetery on Queen's Road, now converted into the S.K. Patil Garden.

While the fishermen from south India used primitive catamarans made by lashing a few planks of wood, the fishing boats of Bombay Presidency were of such superb design that an engine could be fitted on to them without any structural modification.

Excellent docking facilities and a safe harbour are two other reasons for Bombay's

popularity. The Marine Survey vessel *R.I.M.S.S. Investigator* had its base at Bombay, and passed the rigorous monsoon months here. *H.E.M.S. Mabahiss* of the John Murray Expedition led by Lt. Col. R.B.S. Sewell (1933-34) docked at Bombay on December 13, 1993. Later, during the International Indian Ocean Expedition (1960-65), Bombay was the base for the U.S. oceanographic vessel *Anton Bruun*, which made nine cruises in the Indian Ocean. (At the end of the IIOE, the U.S. Government offered *Anton Bruun* free of charge, as a gift, to India, but this offer was reluctantly rejected as the Government of India felt that it could not afford its running costs, amounting to Rs. 100,000 per day. *O.R.V. Sagar Kanya*, incidentally, requires Rs. 200,000 per day as its running costs.)

If one goes by genealogy, the oldest institute in this State, known for its high quality of field studies, is the Bombay Natural History Society. Its role in marine sciences is, however, a low key one, as its forte is mammalogy and ornithology, but one cannot do justice without at least referring to it. The Society's collections are now considered a protected national heritage and, especially as birds and mammals go, rival those of the Zoological Survey of India. Part of the Society's collections was shifted to the Prince of Wales Museum created in 1921. The Society also brings out its own Journal, begun in 1886 and catering to field biology and natural history. It also has a popular magazine named *Hornbill*.

Equally as popular as the city's museum is the Taraporevala Aquarium on Marine Drive. It has had a long wait before a single person's dream bore fruit. This person was Dr. Sam B. Setna, who tirelessly cajoled and needled the authorities until the bureaucracy was moved by his pleas.

In 1931 and 1932, he went as Fishery Officer to the Andaman Islands, where he was dazzled by the fascinating coral reefs and associated marine life. In 1933, he became an officer in the Fisheries Section of the Industries Department of the Government of Bombay. A full-fledged



Department of Fisheries was set up in 1945 and he became the first Director of Fisheries, a position he was to hold till his retirement in 1955.

The first proposal for the establishment of a public aquarium in Bombay was made in 1912 by Mr. W.S. Millard, the Honorary Secretary of the Bombay Natural History Society. He was deputed by the Government of Bombay to visit Madras and report to Government on the Aquarium there. Nothing came of it and Dr. Setna, then on the staff of the Royal Institute of Science, revived the proposal in 1930. He also wrote a series of articles in the local newspaper columns for setting up a marine biological station which could serve as a Mecca for those aspiring to specialise in the study of marine life.

In the meantime, in 1926, the University of Bombay had appointed a seven member committee to consider the desirability of establishing a marine biological station at Bombay. At the joint session of the Zoology and Botany Section of the Indian Science Congress at Patna in 1933, under the presidentship of Lt. Col. R.B.S. Sewell, a resolution was unanimously passed, advocating the establishment of a marine biological station. This proposal was also endorsed by Dr. J. Stanley Gardiner, Head of the Zoological Laboratory at Cambridge, who had earlier worked on the fauna of Maldiva and Laccadive Islands. The question of having an Aquarium was again opened afresh in the early 1930s by Sir Reginald Spence, Honorary Secretary of the Bombay Natural History Society. Finally, the munificence of Mr. Vicaji D.B. Taraporevala and his wife Putlibai, in the form of a joint donation of Rs. 200,000 in 1945, enabled the establishment of a public aquarium and a marine biological station attached to it. Subsequently, they donated a further amount of Rs. 100,000 towards the setting up of a library (called the Shrimati Putlibai Taraporevala Library) as a part of the marine biological station. The Aquarium opened on May 27, 1951.

The Taraporevala Marine Biological Station also had its own 15-metre research boat

*Mysis*. Until 1972, the Research Station was a part of the State Fisheries Department and was affiliated to the University of Bombay. It was then taken over, first by the Mahatma Phule Agriculture University, and now, forms part of the Fisheries wing of the Konkan Agriculture University.

The State Department of Fisheries, realising that marine research activities were concentrated at Bombay, set up a second marine biological station at Ratnagiri in the south of Bombay State. This, too, has been taken over by the Konkan Agriculture University.

As in other States, there are many institutions primarily oriented towards fishery, but also playing their part in marine sciences. Apart from the western region office of the National Institute of Oceanography, there are in Bombay the Central Institute of Fisheries Education (CIFE), Fishery Survey of India (earlier named Exploratory Fisheries Project, and still earlier known as Deep-Sea Fishing Station), Regional Research Station of the Central Marine Fisheries Research Institute (CMFRI), and the local chapter of the Indian National Science Academy (earlier called the National Institute of Science, and which brings out the *Indian Journal of Marine Sciences*).

#### GUJARAT

Besides the offshore Lakshadweep group of islands, the Gulf of Kachchh (=Kutch) near Port Okha is the only region on the west coast of India having abundant coral reefs. The rich flora and fauna associated with these coral reefs has attracted the attention of marine biologists for a long time.

A good deal of work on the algal (seaweed) flora of the former Bombay Presidency was done at Karachi (Sind was then a part of Bombay Presidency) as early as 1859 by W.J.S. Pullen, followed by F. Boergesen between 1930 and 1938. The fortuitous circumstances of Okhamandal being a part of the former Baroda State, ruled by the enlightened Gaekwads (rajahs), led to the



most outstanding study of the region. At the behest of Gaekwad Sayajirao, James Hornell, F.L.S., then serving in the Bureau of Fisheries, Madras and earlier Marine Biologist to the Government of Ceylon made an in-depth study of the region from December 1905 to January 1906. The results of this study are embodied in the MARINE ZOOLOGY OF OKHAMANDAL, the first volume of which was published by William Norgate, London in 1909, followed by Part II in 1916.

This has resulted in the (rather belated) establishment of the Gujarat Aquatic

Sciences Research Station at Okha in the early 1970s.

Notable work on the State's flora was also done at the Central Salt and Marine Chemicals Research Institute (CSMCRI), located at Bhavnagar, in the 1960s. The Institute was established as a laboratory of CSIR in 1954 (when Bhavnagar was in the erstwhile Saurashtra State) and has a branch at Okha. For a detailed review of work done on Indian seaweeds, one may refer to J.N. Misra's paper titled "Phaeophyceae in India," an ICAR publication of 1966.

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